

SECRETARY, D. I.

The authors of the article explain the significance of the work on block polymers as follows:

"At present requirements of a complex nature are put in various branches of the industry to products made of high-molecular compounds. These requirements comprise superior heat stability, improved mechanical and dielectric characteristics, stability to the action of water, chemical stability, retention of the original characteristics after prolonged use of the products, and stability at low temperatures combined with a resistance to the action of gasoline and oil. However, none of the available types of polymers can completely satisfy all the requirements mentioned above. For that reason it has become necessary to combine different types of polymers in such a manner that the materials resulting from their interaction will possess all the desired properties." (U)

54M 1371

SLONIMSKIY, G.L.

BERESTNEVA, Z.Ya.; SLONIMSKIY, G.L.

On the fiftieth birthday of Valentin Alekseevich Kargin. Koll.zhur.  
19 no.2:129-130 Mr-Ap '57. (MLRA 10:5)  
(Kargin, Valentin Alekseevich, 1907--)

MARGIN, V.A.; KITAYGORODSKIY, A.I.; ~~SLONIMSKIY, G.L.~~

On the structure of linear polymers. Koll.zhur. 19 no.2:131-132  
Mr-Apr '57. (MLRA 10:5)

1. Moskovskiy gosudarstvennyy universitet im. M.V. Lomonosova i  
Institut elementoorganicheskikh soedineniy AN SSSR, Moskva.  
(Polymers)

SLONIMSKIY, G. L.

*Notes*  
Transformation of amorphous and crystalline polymers from solid to fluid state on introduction of low-molecular substances. N. A. Kargin, G. L. Slonimskiy, and L. Z. Rogozhina (L. Ya. Karpov Inst. Phys. Chem., Moscow). Kolloid. Zher. 19, 142-11 (1957); cf. C.A. 50, 1645c. — The polymer was compressed (for 16 sec. by 50 g./sq. cm. and the resulting deformation  $D$  was plotted as function of the temp.  $T$  of the expts. For poly(vinyl chloride) (I),  $D$  was small below and large above 110°, but it showed no flow at any temp. Addn. of dibutyl phthalate (II) to I increased  $D$ ; when the content  $x$  of II reached 80%, true flow occurred at  $T > 110^\circ$ , and the system showed 2 temp. regions of softening. At, e.g.,  $x = 90\%$ , the elastic region disappeared and at e.g.,  $x > 95\%$ , the system was definitely liquid; the  $x$  at which these changes took place were greater the higher was the mol. wt. of I. The effect of II on poly(methyl methacrylate) was more gradual; the elasticity disappeared above  $x = 75\%$ , and the system was liquid at  $x = 90\%$ . A copolymer (III) of caprolactam and adipate and azelate of  $H_2N(CH_2)_6NH_2$  was plasticized with  $x\%$  *m*-cresol. When  $x$  was 0%, the m.p. of the system was higher than that of III alone; at greater  $x$ , the m.p. decreased when  $x$  increased, and at  $x = 75\%$  the system was a liquid at room temp.

J. J. Bikerman

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SLONIMSKIY, G.L.

Journal of Physical Chemistry

Vol XXXI, Nr 1, 1957

INVESTIGATION INTO THE PROCESS OF CURING OF PHENOL-FORMALDEHYDE  
RESINS/5

III. INVESTIGATION OF RESINS

*L. I. Golubenkova, G. L. Slonimskiy and V. A. Karala (Moscow)*

Summary

A study of the mechanical properties of resins has shown that the three-dimensional network in resins of such type is formed by bonds of both chemical and physical nature. The main role in determining the complex of mechanical properties of the resins is played by hydrogen and not by chemical bonds that are formed only on prolonged heating at elevated temperatures.

Attention is drawn to the underestimation of the part played by physical interactions in developing concepts regarding the mechanism of curing.

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LEONT'YEVA, V.P., inzh.; SLONIMSKIY, G.L., doktor khim.nauk.

Investigating rubber materials used as sealings in airplane hydraulic system units and subjected to all-round isothermal pressures. Trudy MAI no.93:5-20 '57. (MIRA 10:12)  
(Rubber goods--Testing)

KARGIN, V.A., akademik; KOVARSKAYA, B.M.; GOLUBENKOVA, L.I.; AKUTIN, M.S.;  
SLONIMSKIY, G.L.

Block-copolymer from phenol-formaldehyde resins and nitrile  
rubber. Dokl. AN SSSR 112 no.3:485-486 Ja '57. (MLRA 10:4)

1. Gosudarstvennyy nauchno-issledovatel'skiy i proyektnyy  
institut plasticheskikh mass.  
(Nitrile rubbers) (Phenol condensation products)

PA - 2911

AUTHOR  
TITLE

LEVIN B.Yu., SLONIMSKIY G.L.  
On the Origin of Meteoritic Chondrules.  
(K voprosu od proikhozhdenii meteoritnykh khondr.- Russian)  
Doklady Akademii Nauk SSSR 1957, Vol 113, Nr 1,  
pp 62 - 64.

PERIODICAL

Received: 6/1957

Reviewed: 7/1957

ABSTRACT

About 90% of meteorites are chondrites, i.e. they consist of silicate rounded granules called chondrules, bound by a cementing mass. Because of the existence of glass in the chondrules their origin is usually explained by the rapid solidification of silicate drops which were formed either on the occasion of the decay of a planet, ancestor of meteorites, or on the occasion of a collision of many asteroid bodies. The first hypothesis is not sufficiently motivated, whereas the second certainly played an important part in the evolution of meteoritic substance, not on the occasion of chondrule-formation, but much later. Both hypotheses assume that the interior of the celestial bodies was glowing and the differentiation of the substance took place here. However, chemical composition of meteorites, shows that the formation of bodies of which they are

CARD 1/3



PA - 2911

**On the Origin of Meteoritic Chondrules.**

in meteorites mostly existing at low temperatures crystallization must be retarded by millions and billions years. The condensation of the gas molecules which leads to the formation of amorphous (glass) chondrules must have taken a selective course a fact which explains the rather uniform composition of the chondrules. On the whole, they contain silicates and aluminosilicates.

**ASSOCIATION:** Institute of Terrestrial Physics "O.Yu. Shmidt" and  
Institute for Element-Organic Compounds of the Academy of  
Science of the U.S.S.R.

**PRESENTED BY:** V.A. KARGIN

**SUBMITTED:** 19.11. 1956

**AVAILABLE:** Library of Congress.

**CARD 3/3**



~~Se~~ Slonimskiy, G. L.

AUTHORS: Korshak, V. V., Slonimskiy, G. L., Krongauz, Ye.S. 62-2-15/28

TITLE: From the Field of Heterogeneous Chain Polyamides (Iz oblasti geterotsepykh poliamidov). Information 7: On the Thermal Destruction of Polyhexamethylenadipinamide (Soobshcheniye 7. O teplovy destruktzii poligeksametenadipinamida).

PERIODICAL: Izvestiya AN SSSR Otdeleniye Khimicheskikh Nauk, 1958, Nr 2, pp. 221-226 (USSR).

ABSTRACT: The considerable expansion of the field of application of high polymers during recent years required further investigation of the behavior of these polymers under various conditions, among them also in the case of their aging. This phenomenon may be caused by various external circumstances, the causes may be of a physical or of a chemical nature. Because of the immense variety of the aging-phenomena of polymers the authors considered it useful to investigate one of the simplest causes of the aging of these polymers - the thermal cause- especially carefully. As test object the authors selected polyhexamethylenadipinamide. The influence exerted by the heating of the molten polyamide upon its molecular weight was especially thoroughly investigated. In the case of isothermal heating

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From the Field of Heterogeneous Chain Polyamides. Information  
7: On the Thermal Destruction of Polyhexamethylenadipinamide.

62-2-15/28

a successive reduction of the molecular weight could be observed, where its very definite significance was determined at  $300^{\circ} \sim 9000^{\circ}$  (see figure 3). The processes of the growing of the chain take place simultaneously with the thermal destruction of the polyamide in the inner medium. As the decrease in the molecular weight takes place independent from the type of end-groups of the chain (and still more intensively in the high-molecular polyamide), it is concluded that the destruction-processes do not only take place at the ends but also at any places of the chain (figures 6-8). The experiment showed that a certain molecular weight in the molten polyamide of the above-described type (independent from the initial stage of polymerization) a certain molecular weight is obtained the quantity of which depends on the temperature of the heated polyamide. The special part played by the destructive-recombined equilibrium was emphasized in this connection, especially the part of the interchain-exchange reactions in the determination of the equilibrium value of the molecular weight of the polyamide on the given conditions. There are 8 figures, 1 table, and 12 references, 9 of which are Slavic.

Card 2/3

From the Field of Heterogeneous Chain Polyamides. Information 62-2-15/28  
7: On the Thermal Destruction of Polyhexamethylenadipinamide.

ASSOCIATION: Institute for Element-Organic Compounds AN USSR (Institut  
elementoorganicheskikh soyedineniy Akademii nauk SSSR).

SUBMITTED: August 9, 1956

AVAILABLE: Library of Congress

1. Polyhexamethylenadipinamide-Thermal destruction
2. Polyamides-Analysis

Card 3/3

LEVIN, B.Yu.; SLONIMSKIY, G.L.

Origin of meteorite chondris. Meteoritika no.16:30-36 '58.  
(MIRA 11:8)

(Meteorites)

~~SECRET~~ ~~CONFIDENTIAL~~ L.I.

69-20-1-5/20

AUTHORS: Golubenkova, L.I., Kovarskaya, B.M., Akutin, M.S., Slonimskiy, G.L.

TITLE: Thermomechanical Investigation of Epoxide Resins (Termomekhanicheskoye issledovaniye epoksidnykh smol)

PERIODICAL: Kolloidnyy Zhurnal, 1958, Vol. XX, # 1, pp 34-37 (USSR)

ABSTRACT: Epoxide resins may be either thermoplastic or thermoreactive, depending on the initial diphenyl propane and epichlorohydrine components. Thermoreactivity begins at a molar ratio of 1 : 1.5 of the initial components and at a further decrease of the epichlorohydrine content. The thermomechanical curves of the initial resins were obtained on a dynamometric scale. The solidified specimens were measured on a consistometer. Epoxide resins are low-molecular, i.e. they pass from the vitrified condition into a viscous-fluid one. The vitrification temperature varies between 5-50°C. Solidified resins are prepared by using a hardening agent, polyethylenepolyamine, for 30-45 days. The reduction of the epichlorohydrine content to a ratio of 1 : 1.2 and a 10-hour heating at 200°C produces the resin type ED-15, which is elastic at increased temperatures. Resins with lower numbers of epoxide groups are more elastic

Card 1/2

AUTHORS: Gengrinovich, B.I.; Slonimskiy, G.L. 69-58-2 -3/23

TITLE: Investigation of the True Viscosity and Elasticity of Types of Rubber and Rubber Stocks (Issledovaniye istinnoy tekuchesti i elastichnosti kauchukov i syrykh rezinovykh smesey)

PERIODICAL: Kolloidnyy zhurnal, 1958, Vol XX, Nr 2, pp 143-148 (USSR)

ABSTRACT: The deformation of types of rubber and rubber stocks, under the influence of an external force, takes place in the form of reversible deformation (high-elastic deformation) and in the form of irreversible deformation (the true viscosity). The mechanical properties of types of rubber and rubber stocks are studied in the article by the method of uniaxial compression of cylindrical specimens 10x10 mm in size. The measurements were taken on a specially adapted consistency meter. The initial stress was varied from 0.13-1.86  $\cdot 10^6$  dyn/cm<sup>2</sup>; the duration of deformation from 3-300 min. The types of rubber tested were produced on the base of the polymer SKB-50 sr without vulcanizing agents. Figure 1 shows that pure rubber is more easily deformed than its mixtures. The introduction of carbon black decreases the value of the general deformation. The dependence of the plastoelastic

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69-58-2 -3/23

Investigation of the True Viscosity and Elasticity of Types of Rubber and Rubber Stocks

characteristics on the duration of deformation and the value of stress at different temperatures is shown in figure 3 and 4. At temperatures lower than  $70^{\circ}\text{C}$ , the elastic modulus decreases with the time; at temperatures above  $70^{\circ}\text{C}$  the modulus increases. This is due to chemical or physical-chemical changes in the structure of the substance. Figure 4 shows that the viscosity depends on the duration of the force acting on the specimen, on the value of the force, and on the temperature. At  $40^{\circ}\text{C}$  and lower, the viscosity decreases in the course of time. At a higher temperature and also at greater forces, the viscosity increases with time. The experimental results indicate that the structure of the substances is changed during deformation. There are 4 graphs and 3 references, 2 of which are Soviet and 1 English.

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69-58-2 -3/23

Investigation of the True Viscosity and Elasticity of Types of Rubber and Rubber Stocks

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti, Moskva (Scientific Research Institute of the Tire Industry, Moscow)

SUBMITTED: November 20, 1956

1. Rubber--Elasticity--Analysis 2. Rubber--Viscosity--Analysis

Card 3/3

SECRETARY / G.L.

76-1-19/32

AUTHORS: Lipatov, Yu. S. , Kargin, V. A. , Slonimskiy, G. L.

TITLE: An Investigation of Orientation in High Polymers (Issledovaniye orientatsii v vysokopolimerakh)  
III. The Effect of Orientation on the Vitrification Temperature of Amorphous Polymers (III. Vliyaniye orientatsii na temperatury steklovaniya amorfnykh polimerov)

PERIODICAL: Zhurnal Fizicheskoy Khimii, 1958, Vol. 32, Nr 1, pp.130-134 (USSR)

ABSTRACT: In order to determine in what respect the softening temperature of the orientated films varies in comparison to the non-orientated ones, the shrinkage temperatures of orientated and non-orientated polystyrene samples (as an example of a polymer, about which literature data are available) and polymethylmethacrylate samples (about which no data are known) were investigated here. Under assumption that the effect of interior stresses upon the softening temperatures is analogous to the effect of the exterior stresses, the softening-(shrinkage-) temperatures of films with frozen-up interior stresses here were compared to the temperatures at the beginning of deformation of the non-orientated films under influence of stresses, which are according to their quantity near the interior stresses of the samples of orientated polymers. The heating of the orien-

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76-1-19/32

An Investigation of Orientation in High Polymers. III. The Effect of Orientation on the Vitrification Temperature of Amorphous Polymers

tated films at a given deformation (4-12 hours at 120°C) for the purpose of decrease of the interior stresses at the expense of the relaxation caused the increase of the softening temperature up to 98 - 100°C in the case of films, which were expanded up to the relative expansion of 2000-3000% at a stress of the order of magnitude of 300-500 g/mm<sup>2</sup>. It is shown that in the case of almost equal stresses the softening temperature of the non-orientated sample is essentially lower. If this temperature is extrapolated for the zero-value of the stress, a softening temperature of 85-90°C is obtained, the fact of which is in agreement with the data from other publications for polystyrene. The temperature for the softening of orientated polymethylmethacrylate amounted to 84-87°C, whilst that one of the isotropic sample showed 98°C. Thus, the softening temperatures of the orientated samples with great interior stresses coincide with those ones of the isotropic samples with very small stresses, whilst in polymethylmethacrylate such a phenomenon does not occur. Without doubt, this fact shows a different process during the vitrification of these polymers. The vitrification of the polymer is determined by two causes: 1.) Increase of the intermolecular interaction in the case of a temperature drop, and 2.) increase of the intra-molecular interaction. Both effects

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76-1-19/32

An Investigation of Orientation in High Polymers. III. The Effect of Orientation on the Vitrification Temperature of Amorphous Polymers

cause the loss of the mobility of the chains (reference 7). The fact that the softening temperature of the orientated films of polystyrene is essentially higher than that of the non-orientated films, (on occasion of equal exterior stresses), shows that the relaxation processes in orientated polystyrene are frozen up. Simultaneously, the decrease stated here of the packing-density of polystyrene on occasion of its orientation (reference 3), as well as the presence of interior stresses might promote a decrease of the vitrification temperature.

The data obtained here may be explained as follows: The polystyrene without polar groups, which show a strong interaction cannot be regarded as a polymer, the vitrification of which is determined by the formation of lasting intermolecular bonds. High interior stresses cause a decrease of the softening temperature. This decrease is the greater, the greater the interior stresses (reference 4). Thus, the softening temperature of an orientated sample must be lower than it is in the case of a sample being not exposed to the influence of forces and which is non-orientated. Nevertheless, these temperatures coincide in the experimental range. This can

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76-1-19/32

An Investigation of Orientation in High Polymers. III. The Effect of Orientation on the Vitrification Temperature of Amorphous Polymers

only be connected with the fact that the straightening of the chain (which is the case on the occasion of an orientation) renders the transition of the chain from one configuration to the other more difficult, however, which is equivalent to an increase of the vitrification temperature. In the present case the softening temperature of an orientated polystyrene is determined by 1) the interior stresses decreasing the softening temperature, and 2) by the phenomenon of mechanic vitrification. Both effects possibly compensate one another to an arbitrary degree. The decrease of the interior stresses at the expense of their relaxation causes the fact that the temperature for the softening of the orientated sample will be higher, than of a non-orientated one.

No coincidence of the softening temperatures of orientated samples with high stresses with those ones of the non-orientated sample exists in the case of polymethylmethacrylate. This corresponds to the conception given here on the loosening of structure of polymethylmethacrylate in the case of an orientation. There are 1 table, and 7 references, 4 of which are Slavic.

Card 4/5

71-1-1/52  
An Investigation of Orientation in High Polymers. III. The Effect of Orientation  
on the Vitrification Temperature of Amorphous Polymers

ASSOCIATION: Physical-Chemical Institut imeni L. Ya. Karpov, Moscow  
(Fiziko-khimicheskiy institut im. L. Ya. Karpov, Moskva)

SUBMITTED: October 22, 1955

AVAILABLE: Library of Congress

Card 1/5

SLONIMSKIY, G.L.; YERSHOVA, V.A.

Dependence of the deformation of crystalline polymers on  
temperature. Vysokom.sped. 1 no.2:240-243 P '59.  
(MIRA 12:10)

1. Institut elementoorganicheskikh soyedineniy AN SSSR.  
(Polymers)



ANDRIANOV, K.A.; SLONIMSKIY, G.L.; DIKAREVA, T.A.; ASNOVICH, E.Z.

Solubility and thermomechanical properties of polyaluminum  
organic siloxanes. Vysokom.sped. 1 no.2:244-247 F '59.  
(MIRA 12:10)

1. Institut elementoorganicheskikh soyedineniy AN SSSR i  
Vsesoyuznyy elektrotekhnicheskiy institut im. V.I. Lenina.  
(Plasticizers) (Siloxanes) (Aluminum organic compounds)

SLONIMSKIY, G.L.

"Solutions of macromolecular compounds" by S.S.Voiutskii.  
Reviewed by G.L.Sloninskii. Vysokom.sped. 1 no.2:332-333  
P '59. (MIRA 12:10)

(Macromolecular compounds)  
(Voiutskii, S.S.)

SLONIMSKIY, G.L.; GATOVSKAYA-RODINA, T.V., kand.khim.nauk [translator];  
PRAVEDNIKOVA, A.N., kand.khim.nauk [translator]; KARGIN, V.A.,  
akademik, red.; MALINSKIY, Yu.M., kand.khim.nauk, red.

"Textbook of polymer chemistry" translated for the English by  
F.W.Billmeyer. Reviewed by G.L.Slonimskii. Vysokom.sped. 1 no.2:  
333-334 F '59. (MIRA 12:10)  
(Polymers) (Billmeyer, F.W.)

SLONIMSKIY, G.L.; BERESTNEV, V.A.

Discussing the problem of the strength of polymer materials.  
Vysokom. soed. 1 no.3:485-486 Mr '59. (MIRA 12:10)  
(Polymers--Congresses)

SLONIMSKIY, G.I.; FRUNZE, T.M.; KORSHAK, V.V.; BOGOVINA, L.Z.

Effect of the composition of mixed polyamides on their phase state. Vysokom.soed. 1 no.4:526-529 Ap '59. (MIRA 12:9)

1. Institut elementoorganicheskikh soedineniy AN SSSR.  
(Amides) (Phase rule and equilibrium)

SLONIMSKIY, G.L.; FRUNZE, T.M.; KORSHAK, V.V.; ROMANOVA, Z.V.; ROGOVINA, L.Z.

Thermomechanical study of polyamides made from cis- and trans-isomers of diaminocyclohexane and aliphatic dicarboxylic acids.  
Vysokom.soad. 1 no.4:530-533 Ap '59. (MIRA 12:9)

1. Institut elementoorganicheskikh soedineniy AN SSSR.  
(Amides) (Cyclohexanediamine) (Acids)

SLONIMSKIY, G.L.; REZTSOVA, Ye.V.

Mutual solubility of polymers. Part 5: Mechanochemical compatibility. Vysokom.sped. 1 no.4:534-538 Ap '59. (MIRA 12:9)

1. Nauchno-issledovatel'skiy institut shinnoy promyshlennosti.  
(Rubber, Synthetic)

SLONIMSKIY, G.L.; KORSHAK, V.V.; GOLUBEV, V.V.; VELIKOVSKAYA, N.A.

Properties of mixed glycol polyesters of terephthalic and sebacic acids as a function of the acid ratio. Vysokom. soed. 1 no.6:925-929  
Ja '59. (MIRA 12:10)

1. Institut elementoorganicheskikh soedineniy AN SSSR.  
(Terephthalic acid) (Sebacic acid)



SLONIMSKIY, G.L.; KOZLOV, P.V.

Eighth Mendeleev conference and polymer science in U.S.S.R. Vysokom.  
soed. 1 no.7:1112-1125 J1 '59. (MIRA 12:11)  
(Chemistry--Congresses)

SOV/138-59-3-7/16

AUTHORS: Veresotskaya, N.V., Bebris, K.D., Slonimskiy, G.L.

TITLE: Variations in the Properties of Crude Rubber Mixtures During Processing ( Ob izmeneniyakh svoystv syrykh rezinovykh smesey v protsesse ikh tekhnologicheskoy obrabotki)

PERIODICAL: Knuchuk i rezina, 1959, Nr 3, pp 27 - 33 (USSR)

ABSTRACT: The formation of free radicals in high-molecular substances due to the rupturing of the molecular chains during polymerisation, vulcanisation and ageing of rubbers has been described in various publications (References 1 - 9). These radicals initiate a number of secondary processes: the interaction of radicals with the chain molecules, the formation of branched chains, the oxidation processes, stabilisation of the radicals during the interaction with formation of saturated compounds. The authors investigated the properties of crude rubber mixtures based on butadiene-styrene rubber during

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SOV/138-59-3-7/16

## Variations in the Properties of Crude Rubber Mixtures During Processing

their preparation and processing. Their plastic and elastic properties were tested on a Goodrich plastometer at 80°C when loading for 10 minutes and after a relaxation period of 10 minutes. Experimental results of non-processed and processed mixtures are shown in a graph in Figure 1. Improved technological properties of the mixtures were obtained when processing a quickly-cooled mixture. The plastic and elastic properties of mixtures change to a slighter degree when processing is carried out under industrial conditions (Figure 2). The tendency to scorching when mixtures, cooled to room temperature after mixing, are processed at 110°C, is shown in Figure 3. The plastic and elastic properties of mixtures containing channel black and furnace black were also tested (Figure 4). Conditions of processing sometimes affect the degree of plasticisation of the mixtures in the initial stages of heating (5 to 10 minutes in a thermostat at 110°C), but have no appreciable effect on the final results i.e. on the plasticity of a mixture after heating for 50 to 60 minutes. Changes in the prop-

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SOV/138-59-3-7/16

Variations in the Properties of Crude Rubber Mixtures During Processing

erties of rubber mixtures for tyres during processing were investigated (Figure 5). The obtained curves proved that approximately equal changes occur as during laboratory experiments. Changes in the strength of bonding between the layers during repeated displacement are shown to depend on the processing of mixtures on the rollers (Figure 6). Experiments were carried out on multi-component tyre mixtures based on SKS-30A with a plasticity of 0.49 (according to Karrer). Different quantities of inhibitors and initiators were added during the polymerisation process (from 0.02 to 2% by weight). The additives were introduced into the cold mixture during processing at temperatures of 50 and 70°C over a period of 7 minutes. The plastic and elastic properties of crude mixtures were again determined on a Goodrich plastometer at 80°C during 10 minute deformation, and after

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SOV/158-59-3-7/16

Variations in the Properties of Crude Rubber Mixtures During Processing

a relaxation time of 10 minutes. The reactivity of the mixture was defined according to the scorching tendency at 110°C. The physical and mechanical properties of the vulcanisates were also analysed. The most effective additives were: benzoquinone, Santovar-0 and hexamethylene tetramine; these compounds were added in the form of a solution in glycerine. Changes in the properties of crude tyre mixtures after rolling for 7 minutes at 30°C with/without additives are shown in Figure 7. The plasticity and reactivity of the mixture increases on introducing additives; thus the tendency to scorching becomes greater and affects the physical and mechanical characteristics of the vulcanisates (Table 1); (increased elasticity modulus and decreased relative elongation). The plasticity and reactivity of the mixture increases when Santovar-0 and benzoquinone are added (Table 2). The physical and mechanical properties are, however, not affected by these additives, but the elastic modulus and tensile strength increase slightly when Santovar-0 is added and the relative elongation decreases. Data on the observed effect of small

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SOV/138-59-3-7/16

Variation in the Properties of Composites Mixtures During Processing

quantities of additives on the change of physical and elastic properties of mixtures during rolling agree with the results obtained by other investigators (refs 12 - 18).

There are 7 figures, 2 tables and 18 references of which 10 are Soviet, 1 English and 1 French.

ASSOCIATION: Nauchno-isledovatel'skiy institut shinnoy promyshlennosti (Scientific Research Institute of the Tyre Industry)

Card 5/5

SOV/63-4-1-11/31

The Mechanical-Chemical Phenomena in Rubber and Rubber Mixtures and Their Role in the Formation of the Rubber Properties

ence of the mechanical effects in the laboratory and the industry explains the discrepancy between the properties of rubbers produced by the laboratory and industrial method. The "chemical flow" of the rubber [Ref 12] is explained by the rupture of the chain molecules due to mechanical effects and the combination of these molecular parts into a complex macromolecular system. During the mixing of rubber with carbon blacks the free radicals interact with the surface of the carbon black particles forming stable structures [Ref 5, 20]. The increased resistance of the rubber after filling is caused by mechanical-chemical processes during mixing, therefore. Fatigue of the rubber is explained by the breaking of chain molecules during deformations. The formation of free radicals which induce oxidation processes is especially dangerous. The selection of the inhibitor is very important for the control of fatigue resistance. In multi-layer rubber products some layers peel off due to fatigue in the boundary layer. The introduction of an inhibitor into the junction zone increases the stability of connection between the layers. Molecules can be made of the parts of broken molecules. Such copolymers are

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SOV/63-4-1-11/31

The Mechanical-Chemical Phenomena in Rubber and Rubber Mixtures and Their Role in the Formation of the Rubber Properties

obtained by processing the initial polymers in the absence of inhibitors. The properties of these mechanical-chemical copolymers are often the sum of the properties of the initial polymers. Polymerization is induced by mechanical actions. The polymers must be free of inhibitors, however. Low-molecular substances may be introduced which polymerize according to the radical mechanism. The obtained polymers are also linear and in many cases less branched than the initial components. It is necessary to study the nature of the breaking of the chemical bond more intensively as well as the different types of inhibitors.

There are 30 references, 16 of which are Soviet, 12 English, 1 German and 1 Swedish.

Card 3/3



28(5),15(9)

AUTHORS:

Yegorova, M. I., Palkin, B. A.,  
Slonimskiy, G. L.

SOV/32-25-9-38/53

TITLE:

Micro-hardness Gauge for Rubber

PERIODICAL:

Zavodskaya laboratoriya, 1959, Vol 25, Nr 9, pp 1127-1129  
(USSR)

ABSTRACT:

The micro-hardness gauges (MG) for rubber (R) (Ref 1) at present used possess a low sensitivity with respect to the hardness (H) change of (R) with medium or higher (H) (above 60 Shore units) and also show considerable differences with parallel measurements of one and the same sample. The micro-hardness of (R) is to be evaluated according to two readings taken within a certain period of time i.e. according to the depth of penetration of the indenter (I) which has definite dimensions and a definite shape and is under a definite pressure, as well as according to the degree of residual deformation (RD) after a reduction of the stress. A (MG) was designed which permits measurements of the penetration depth of the (I) as well as the (RD) under the influence of temperature, a medium, repeated deformations, etc., on (R) and similar materials. The following working procedure was chosen:

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Micro-hardness Gauge for Rubber

SOV/32-25-9-38/53

30 seconds load application, 60 seconds maintenance of full load, 30 seconds load removal. The device (Fig 2) basically consists of an optical system (with two objectives and an illuminator tube of the type OI-1), a semi-automatic load application unit, the (I) unit, the objective stage, and a sturdy stand. The two latter parts were taken over from the (MG) of the type PMT-3 designed for metal tests. The total load of the (I) amounts to 21 g, the (RD) being determined at a load reduction of 20 g. For particularly accurate measurements A. L. Dorofeyev designed an electronic apparatus of the type IT-1 in the VIAM by means of which position changes of the (I) of  $0.5 \mu$  can be measured. The tests showed that measurements of samples of a thickness of 0.5-5 mm can be made. A linear function between the penetration depth of the (I) and the (H) (Fig 3, measurements of SKB and SKN rubber) was determined according to Shore by means of the (MG) of the type TM-2. Hardness changes of 10 Shore units correspond to a penetration depth change of the (I) of  $40 \mu$ , i.e., the described (MG) is four times as sensitive as the

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5(4)

AUTHORS:

Slonimskiy, G. L., Reztsova, Ye. V.

307/76-33-2-35/45

TITLE:

Mechano-chemical Phenomena in Polymers (O mekhaniko-khimicheskikh yavleniyakh v polimerakh). I. A Study of the Phenomenon of Chemical Flow in Raw and Vulcanized Rubbers (I. Issledovaniye yavleniy khimicheskogo techeniya v kauchukakh i rezinakh)

PERIODICAL:

Zhurnal fizicheskoy khimii, 1959, Vol 33, Nr 2, pp 480-486 (USSR)

ABSTRACT:

The recently discovered phenomenon of the chemical flow of polymers (Refs 2-4) which arises from the effect of increased tension must be especially obvious in working processes, for example, the rolling of polymers. In the work of this paper the chemical flow of structured, highly-elastic polymers was studied in linear and three-dimensional flow. Tested were samples of SKB-1 sodium butadiene rubber (without anti-oxidants), technical butadiene styrene SKB-30A rubber, natural rubber (NK), and its vulcanisate, and thermostructured materials (SKB-T). The SKB-1 was produced by the standard method (60 parts by weight of carbon to 100 parts rubber) using NK with Captax (or Altax + diphenyl guanidine) as accelerator. It was rolled on cooled micro-rollers (ratio of the rates of revolution 1 : 1.1)

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Mechano-chemical Phenomena in Polymers.

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I. A Study of the Phenomenon of Chemical Flow in  
Raw and Vulcanized Rubbers

for a time varying from 10 minutes to several hours. After rolling for one hour the "Defo" number (deformation number) for the cold-rolling of the SKB-1 linear polymer fell from 650 to 410, while the hot-rolling caused a decrease from 650 to only 550, thus indicating that the rolling temperature is of importance with polymers which are still structurable. A SKS-30A rubber stabilized with phenyl- $\beta$ -naphthylamine (neozon D) did not show any marked change after being rolled for 21 hours as opposed to the SKB-1 which became brittle and crumbled after 6 hours. From the experimental results obtained (Tables 1-4) and published data (Refs 9-11) it is concluded that mechano-chemical phenomena play a decisive role in the processing of polymers, and that they are not merely side effects as previously believed. The observations in regard to the influence of small amounts of added substances (0.3% di-tert-butyl hydroquinone, dinitrile of azo isosebacic acid, and benzoyl peroxide added to SKB-1) (Table 1), which can initiate or interrupt chain radical processes, on the properties

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Mechano-chemical Phenomena in Polymers.

SOV/76-33-2-38/45

I. A Study of the Phenomenon of Chemical Flow in  
Raw and Vulcanized Rubbers

of rubber indicate on one side the possibility of regulating technological processes and also indicate the determining role played by mechano-chemical phenomena. Because of this, new methods must be developed to evaluate polymers giving due consideration to chemical flow. In conclusion Academician V. A. Kargin is thanked. There are 4 tables and 11 references, 8 of which are Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti  
MKhP SSSR, Moskva (Scientific Research Institute of the Tire  
Industry of the MKhP USSR, Moscow)

SUBMITTED: August 8, 1957

Card 3/3

5(4), 15(8)  
AUTHORS:

SOV/76-33-3-23/41  
Reztsova, Ye. V., Lipkina, B. G., Slonimskiy, G. L.

TITLE:

On Mechano-chemical Phenomena in Polymers (O mekhano-khimi-cheskikh yavleniyakh v polimerakh). II. The Effect of Initiators and Inhibitors of Radical Chain Processes (II. Vliyaniye initsiatorov i ingibitorov tsepnykh radikal'nykh protsessov)

PERIODICAL:

Zhurnal fizicheskoy khimii, 1959, Vol 33, Nr 3,  
pp 656 - 661 (USSR)

ABSTRACT:

Mention is made of results obtained by investigating the variation of plasto-elastic properties in rubber rolling to which various initiators and inhibitors were added. Further, the variations of the durability of rubber due to repeated deformations are mentioned. The authors primarily made experiments with technical butadiene-styrene synthetic rubber (SKS-30A) as well as parallel experiments with natural rubber (NK). According to the recommendations of B. A. Dolgoplosk, Corresponding Member, AS USSR, the following substances were added: Benzoyl peroxide (I), dioxy-diphenyl disulphide (II),

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On Mechano-chemical Phenomena in Polymers. II. The SOV/76-33-3-23/41  
Effect of Initiators and Inhibitors of Radical Chain Processes

dinitrile of azoisobutyric acid (III), di-tert-butyl hydroquinone (IV), tri-tert-butyl phenol (V), polyethylene polyamine (VI), Diproxid (VII), Santovar O (VIII), chloro paraffin (IX), benzoquinone (X), hydroquinone (XI), quinhydrone (XII), acetonyl (XIII),  $\beta\beta'$ -dinaphthyl disulphide (XIV). The substances were rolled in cold state by means of rollers (405 x 146 mm) with a friction of 1:1.22 for one hour at a temperature of 20-30° of the rubber mixture as well as at higher temperatures (for the purpose of vulcanizing the mixtures which were subjected to fatigue tests). The deformation was measured by means of a plastometer according to Gudrich (Ref 2), and the durability was tested by several sample elongations. The authors determined a particularly strong effect on the properties of SKS-30A due to additions of (I) (Fig 1), while NK exhibited the strongest sensitivity to (III) (Fig 2). It was remarkable in this connection that by the variation of the amount of additions opposite effects were obtained. A prolongation of the rolling time considerably increases the effect of additions (Fig 1). (IV) and the other

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On Mechano-chemical Phenomena in Polymers. II. The Effect of Initiators and Inhibitors of Radical Chain Processes

SOV/76-33-3-23/41

quinones exercised only an insignificant influence upon the the raw mixtures but strongly affected the properties of fatigue of the vulcanizates (Figs 3-6). Therefrom it results that a mechano-chemical mechanism of polymer processing as well as of the fatigue tests also indicate merely mechano-chemical processes, which consist in the mechanical destruction of chain molecules with the formation of free radicals producing secondary chemical processes. The initiators and inhibitors added considerably change the course of these mechano-chemical processes (Table) and are therefore capable of affecting both the properties of polymers and the durability of the finished products. There are 6 figures, 1 table and 2 Soviet references.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti Moskva (Scientific Research Institute of the Tire Industry, Moscow)

SUBMITTED: August 8, 1957

Card 3/3



5(4), 15(9)

SOV/76-33-4-7/32

AUTHORS: Slonimskiy, G. L., Drugova, G. P.

TITLE: On Mechano-chemical Phenomena in Polymers (O mekhano-khimicheskikh yavleniyakh v polimerakh). III. Bond Strength Between the Elements of Multilayer Polymer Articles (III. Prochnost' vzaimnoy svyazi elementov mnogosloynnykh polimernykh izdeliy)

PERIODICAL: Zhurnal fizicheskoy khimii, 1959, Vol 33, Nr 4, pp 793-798 (USSR)

ABSTRACT: The low resistivity of multilayer rubber articles is frequently not due to the normal wear of the rubber but to a loosening of the individual layers or of the rubber covering from the textile basis. This destruction due to mechanical stress takes place at the junctions. It was demonstrated already (Refs 2-4) that the chain molecules of the polymers are destroyed under the formation of free radicals due to the deformation stress. Thus secondary chemical processes take place which lead to the destruction of the article. For this reason an increase of the resistivity of multilayer rubber articles (rubber tires) should be obtained by substances which exercise an inhibiting effect on such secondary processes and the

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SO7/76-33-4-7/32

On Mechano-chemical Phenomena in Polymers. III. Bond Strength  
Between the Elements of Multilayer Polymer Articles

processes which take place on the junction surfaces should be observed. Layer materials of normal (SKS-30 A) and oil- (SKS-30-AM)-butadiene-styrene-rubber which were glued by means of an adhesive (on a natural rubber basis) with or without inhibitor addition were investigated. Polyethylene polyamine (I), 2,5-di-tert-butyl hydroquinone (II), dinaphthyl disulphide (III), tri-tert-butylphenol (IV), benzoquinone (V), acetanil (VI), hydroquinone (VII) were investigated in different amounts of addition. The investigation of the dynamic loosening of the layers was carried out on the De-Matti machine. It was found that e.g. additions of three parts by weight of (I) to 100 parts by weight of natural rubber adhesive increase the adhesive power of the samples on an SKS-30A and also SKS-30AM basis (Fig 1) by the 10-fold. The amount of addition to the inhibitor, however, is important because an optimum addition was observed, and on the other hand, a relation between the effect of the inhibitor and the time of rolling of the rubber may be observed (Fig 2). The experimental results obtained in the case of agglutinations with (II)-additions (Table) as well as explanations on the mechano-chemical process in the

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SOV/76-33-4-7/32  
On Mechano-chemical Phenomena in Polymers. III. ~~Bond~~ Strength  
Between the Elements of Multilayer Polymer Articles

separation of the layer are tabulated (Table). There are  
2 figures, 1 table, and 10 Soviet references.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti  
Moskva  
(Scientific Research Institute of the Tire Industry Moscow)

SUBMITTED: August 8, 1957

Card 3/3

15 (9)  
AUTHORS:

Slonimskiy, G. L., Kargin, V. A.,  
Reztsova, Ye. V. (Moscow)

SOV/76-33-5-5/33

TITLE:

On Mechano-chemical Phenomena in Polymers (O mekhano-khimicheskikh yavleniyakh v polimerakh). 4. The Modification of ~~offshore~~ and Vulcanized Rubber (4. Modifikatsiya kauchukov i rezin)

PERIODICAL:

Zhurnal fizicheskoy khimii, 1959, Vol 33, Nr 5,  
pp 988-991 (USSR)

ABSTRACT:

Data from publications (Refs 1-7) indicate that free radicals are formed ~~and~~ mechanical action on raw- or vulcanized rubber and that it is therefore possible to start polymerization processes by mechanical treatment. The authors carried out their investigations in a modifier which had been designed at the Institut plastmass (Institute of Plastics). It consisted of two spirally grooved plates. The upper plate was fixed, the lower plate rotated with 30 rpm. The plates were cooled; and the treatment could take place in air as well as in nitrogen atmosphere. Microcylinders with a friction of 1:1.11 were used in a different series of experiments. Technical products of butadien styrene and sodium butadien were investigated.

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On Mechano-chemical Phenomena in Polymers.  
4. The Modification of ~~Latex~~ and Vulcanized Rubber

SOV/76-33-5-5/33

Vulcanization was carried out according to standard recipes. The mechanically treated samples were tested after vulcanization, and by fatigue tests of the raw product, and partly by determining the solubility and viscosity of the solutions. Equally, tests were carried out with vulcanized rubbers which were swelled into monomers (imitation of regeneration). Tables 1 and 2 give the investigation results and show that chemical processes are brought about by mechanical treatment which can be used for an improvement of the properties and for technical application contrary to earlier assumptions. There are 2 tables and 8 references, 4 of which are Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti  
Moskva (Scientific Research Institute of the Tire Industry,  
Moscow)

SUBMITTED: August 8, 1957

Card 2/2

SLONIMSKIY, G.L., prof., doktor khim.nauk; NESTEROVA, N.M.; NESMEYANOV, A.M., akademik, glavnyy red.; TOPCHIEV, A.V., akademik, zam. glavnogo red.; ISAKOVA, O.V., otv.red.; LIKHTENSHTEYN, Ye.S., otv.red.; SHUNKOV, V.I., otv.red.; LOSKUTOVA, I.P., red.izd-va; YEMIPANOVA, L.V., tekhn.red.

Valentin Alekseevich Kargin. Vstup.stat'ia G.L.Slonimskogo. Bibliografiia sost. N.M.Nesterovoi. Moskva, 1960. 80 p. (Materialy k biobibliografii uchenykh SSSR. Ser.khimicheskikh nauk, no.29). (MIRA 14:3)

1. Akademiya nauk SSSR.  
(Kargin, Valentin Alekseevich, 1907- )

SLONIMSKIY, G.L.

V.V.Korshak's book "Chemistry and technology of synthetic high  
molecular weight compounds." Reviewed by G.L.Slonimskii.  
Vysokom.soed. 2 no.1:175-176 Ja '60. (MIRA 13:5)  
(Macromolecular compounds)  
(Korshak, V.V.)





SLONIMSKIY, G.L.

"Configurational statistics of polymer chains" by M.V.  
Vol'kenshtein. Reviewed by G.L. Slonimskii. Vysokom.  
soed. 2 no. 3:471-472 Mr '60. (MIRA 13:11)  
(Polymers)  
(Vol'kenshtein, M.V.)

15.0102 2109,2209, 1486

84508  
S/190/60/002/004/009/020  
B004/B056

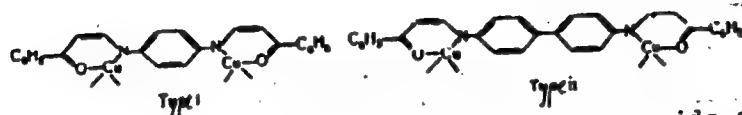
AUTHORS: Nesmeyanov, A. N., Rybinskaya, M. I., Slonimskiy, G. L.  
TITLE: Synthesis of Polymers on the Basis of  $\beta$ -Chlorovinylketones  
PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 4,  
pp. 526-528

TEXT: For a long time the authors have studied compounds of  $\beta$ -chloro-  
vinylketones together with N. K. Kochetkov (Ref. 5), which they obtained  
from acylchlorides and acetylene in the presence of  $AlCl_3$ . In the present  
paper, they give a report on the reaction of p-phenylenediamine or  
benzidine with ( $\beta$ -benzoylvinyl)-trimethylammoniumchloride, which they  
obtained by the reaction of phenyl- $\beta$ -chlorovinylketone with trimethylamine.  
N,N'-di-( $\beta$ -benzoyldivinyl)-diamines are formed, which contain either a  
p- $C_6H_4$  group (decomposition temperature, 258 - 260°C) or a p- $C_6H_4-C_6H_4$   
group (decomposition temperature 304 - 309°C). A direct reaction with  
 $\beta$ -chlorovinylketone leads only to N-monosubstituted products.  
N,N'-di-( $\beta$ -benzoyldivinyl)-diamines with copper acetate chelate give

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Synthesis of Polymers on the Basis of  
β-Chlorovinylketones

compounds of the two types:



Polymerization carried out in dimethylformamide gives fine-disperse powders. In interfacial polymerization (chlorobenzene - water), brownish scales are formed after 30 days of continuous heating. As these compounds are insoluble, their molecular weight could not be determined. The authors, however, assume that it is not very high. The polymer of type I is stable up to 400°C, the polymer of type II up to 350°C. X-ray analysis of type II showed a microcrystalline structure. Magnetic susceptibility is positive (Table), and with increasing magnetic field strength it decreases. Resistivity decreases from  $>10^{-13}$  ohm.cm at 200°C to  $1.4 \cdot 10^{-11}$  ohm.cm at 247°C. Further, a non-melting, black polymer, which is not burned even when heated redhot, but which only slowly becomes richer in carbon, was

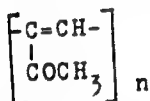
Card 2/4

84508

Synthesis of Polymers on the Basis of  
β-Chlorovinylketones

S/190/60/002/004/009/020  
B004/B056

produced by a separate polycondensation of methyl-β-chlorovinylketone after 20 to 30 days. On the basis of the positive iodoform reaction and the infrared spectrum, the authors presume the structure



. According to the X-ray analysis, this compound is amorphous.

Its magnetic susceptibility also decreases with increasing magnetic field strength. This polymer catalyzes the oxidation of alcohols (CH<sub>3</sub>OH at 250°C, C<sub>2</sub>H<sub>5</sub>OH at 170 - 250°C) by means of air, as well as the dehydrogenation of ethanol at 350 - 400°C. These processes are continued to be investigated. The authors express their gratitude for the investigations carried out at the laboratories of INESO (Institute of Elemental-organic Compounds), IOKh (Institute of Organic Chemistry), and IKhF (Institute of Chemical Physics) of the AS USSR under the supervision of I. V. Obreimov (infrared spectra), A. I. Kitaygorodskiy (X-ray analysis), A. M. Rubinshteyn (electric and magnetic measurements), and L. A. Blyumenfeld (epr spectra). There are 1 table and 6 references:

Card 3/4

Synthesis of Polymers on the Basis of  
 $\beta$ -Chlorovinylketones

84508  
S/190/60/002/004/009/020  
B004/B056

5 Soviet and 1 US.

ASSOCIATION: Institut elementoorganicheskikh soedineniy AN SSSR  
(Institute of Elemental-organic Compounds AS USSR)

SUBMITTED: December 31, 1959

Card 4/4

S/190/60/002/006/004/012  
B015/B064

AUTHORS: Slonimskiy, G. L., Yerzhova, V. A.  
~~Slonimskiy, G. L., Yerzhova, V. A.~~  
TITLE: The Comparison of the Characteristics of Polymers  
Determined by Means of Different Devices  
PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 6,  
pp. 871-874

TEXT: The problem arising from the fact that dynamometers of different design do not supply the same deformation conditions even when the rate of letting down the lower holding is strictly constant, is for the time being not sufficiently being investigated. To explain this, the present paper compares the operation conditions of a dynamometer designed by Polyani and one by Shopper (type PM-3 ~~PM-3~~ FM-3) (Ref. 6). Commercial caprone was used for experimenting. On the basis of the statements made in the introduction it is found that it is possible to calculate in first approximation the elongation of a sample with a certain cross section with the curve "conditional stress . . deformation" after having determined the rigidity of the dynamometer. Thus, in the case of dynamic.

Card 1/2

The Comparison of the Characteristics of Polymers Determined by Means of Different Devices S/190/60/002/006/004/012 B015/B064

meters with varying rigidity also the rate of deformation of the sample will differ even if the same rates of letting down the lower holding are adjusted. Results of measurement made on the two above dynamometers are shown to illustrate the statements made (Table). Considering the spring deflection (of the Polyani device) and the displacement of the arm of the pendulum (of the FM-3 device) it is possible to prove the essential difference between the real rate of length increase of the sample and the speed of motion of the lower holding. In the present investigation, far more exact values of measurement were obtained with the Polyani device since its deviations in the rate of deformation were less high. There are 2 figures, 1 table, and 7 Soviet references. ✓

ASSOCIATION: Institut elementoorganicheskikh soedineniy AN SSSR  
(Institute of Elemental-organic Compounds of the AS USSR)

SUBMITTED: February 11, 1960

Card 2/2





SLONIMSKIY, G.L.

"Autohesion and adhesion of high polymers" by S.S.Voiutskii. Re-  
viewed by G.L.Slonimskii. Vysokom.soed. 3 no.12:1878-1879 D  
'61. (MIRA 15:3)

(Polymers) (Adhesion) (Voiutskii, S.S.)

158500

28935  
S/063/61/006/004/002/010  
A057/A129

112313

AUTHOR: Sogolova, T. I., Candidate of Chemical Sciences, Slonimskiy, G. L.,  
Doctor of Chemical Sciences

TITLE: Thermomechanical method ~~for~~ the study of polymers

PERIODICAL: Zhurnal vsesoyuznogo khimicheskogo obshchestva imeni D. I. Mendele-  
yeva, v. 6, no. 4, 1961, 389-393

TEXT: After discussing characteristics of mechanical properties of poly-  
mers in the present paper the basic principles of the thermomechanical method  
for testing polymers are explained and the application of V. A. Kargin's dyna-  
mometric balance [Ref. 1: ZhFKh, 23, 530 (1949)] is described. Also some  
examples for the use of this method in science and industry are given. The  
method is defined as a determination of the deformability of solid polymers in a  
wide temperature range under a given mechanical stress. Monoaxial compression is  
quoted as the stress most widely used in existing devices. It was first applied  
by Kargin and Sogolov in investigations of three physical states of amorphous  
linear polymers (Ref. 1). The thermomechanical test method is widely used in  
the USSR. Devices with automatic recording and devices in which a continuous

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S/063/61/006/004/002/010

A057/A129

Thermomechanical method for the study of polymers


stress is used under a constant rate of temperature increase are also developed (27 Soviet references are cited in this respect). Kargin's decimal analytical balance is shown in Fig. 1. The weight 5 and punch 3 are in balance with the other pan of the balance. The sample with a minimum height of 2 mm and 4 mm in diameter is placed on the lifting plate 1 below the punch. About 0.2 cm<sup>3</sup> of the polymer are sufficient for the investigation. In case of a liquid or loose material the amount was filled into a special beaker 2 which is fixed on the plate 1. The plate is then lifted by means of a screw mechanism until the surface of the sample contacts the bottom of the balanced punch. Plate, sample and punch are covered with a brass jacket 4 and heating or cooling applied. At the present time devices for the range of - 160°C to 400°C and 0° to 800°C are constructed. The deformation of the sample is measured at the temperature fixed on a thermocouple 7 by removing gradually weights (0.05 g to 100 g), i.e., by increasing the pressure of the punch on the sample and determining the position of the punch. Changes in position of the latter are controlled by measuring the rotation angle of the mirror 6 which is fixed on the balance beam. By measuring deformation at different temperatures the temperature function of deformation, i.e. thermomechanical curve, may be obtained (Fig. 2). The curve shows the point of glass-transition temperature  $T_g$  and flow temperature  $T_f$  ✓

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28935

S/063/61/006/004/002/010  
AO57/A129

Thermomechanical method  the study of polymers

for the polymer transition from the glassy to the high-elastic respectively from the latter to the visco-plastic state. Thus by means of thermomechanical curves important characteristics of the polymer are quickly obtained. Also deformation with time can be studied by compressing the sample at constant temperature with the punch. Thermomechanical curves enable the size and flexibility of the macromolecules and the molecular weight and the prospective use of the polymer studied to be determined (Fig. 3). Low-molecular polymer homologues (curves 1-3) can be in the glassy or liquid state. Beginning from a certain molecular weight (typical for each series of homologues) the high-elastic state (curves 4-7) expands to the higher temperature with increasing length of the macromolecule. Thus the minimum size of the latter can be determined with considerable flexibility. Valuable information  may also be obtained from the thermomechanical investigations related to the effect of plasticizers, modifiers or fillers [see V. A. Kargin and Yu. M. Malinskiy; Ref. 5: DAN SSSR, 73, 967 (1950); V. A. Kargin, T. I. Sogolova and G. Sh. Talipov; Ref. 19: Vysokomol. soyed., 1, 1670 (1959); Ref. 26: Vysokomol. soyed., 2, 1093 (1960), and physical treatment [see V. A. Kargin and M. N. Shteding, Ref. 6: Khim. prom., no. 2, 10 (74) (1955); V. L. Karpov, Yu. M. Malinskiy, L. V. Mitrofanova, S. T. Sinitsin, E. E. Finkel', A. S. Fridman and S. M. Cherntsov, Ref. 20: Khim. prom.

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28935

S/063/61/006/004/002/010  
A057/A129

Thermomechanical method ~~of~~ the study of polymers

no. 6, 6/468 (1959); and also Refs. 19 and 26], such as irradiation, or adsorption of vapors of solvents, or aging [see V. A. Kargin and M. N. Shteding, Ref. 7: Khim. prom, no. 3, 9, 137 (1955)], hardening and vulcanization (investigations carried out also by V. A. Kargin and cooperators). Thermostability of polymers can also be evaluated by this method. Changes in chemical composition and structure which might take place on heating are revealed by changes in the shape of the thermomechanical curves (see Fig. 5). The first maximum of curve 2 (in Fig. 5) is effected by structure developments of the polymer resulting in decrease of flexibility and the loss of fluidity. The other extrema are effected by new chemical processes of destruction and structuration with increasing temperature. The last minimum on the curve demonstrates the loss in elasticity of the polymer, i.e., its solid state. Thus an industrial control in thermostability of different charges of technical polymers can be carried out by the thermomechanical method. The latter combined with other mechanical and physico-chemical test methods is the most effective way for the development in the use of polymer materials, according to the opinion of the present authors. There are 5 figures 32 Soviet references. H

Card 4/6

NESMEYANOV, A.N., akademik; RUBINSHTEYN, A.M.; SLCNIMSKIY, G.L.; SLINKIN, A.A.; KOCHETKOVA, N.S.; MATERIKOVA, R.B.

Magnetic susceptibility of polyalkenopolyferrocenes and polyferrocenylenes. Dokl.AN SSSR 138 no.1:125-126 My-Je '61.  
(MIRA 14:4)

1. Institut elementoorganicheskikh soedineniy AN SSSR.  
(Ferrocene--Magnetic properties)

24.4200

28669  
S/020/61/140/002/014/023  
B104/B102

AUTHOR: Slonimskiy, G. L.

TITLE: The law of deformation of highly elastic polymeric bodies

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 140, no. 2, 1961, 343-346

TEXT: The author shows that the highly elastic deformation of polymeric bodies has to be regarded as an independent type of reversible deformation. In such a deformation, the motion of large chain molecules is composed of the totality of motions of their individual parts (segments). The rules governing the motion of chain molecules can be described by estimating the motions of segments. The displacement of one end of a segment is additively composed of three components: (1) an irreversible component of the whole segment, (2) an elastic, and (3) a highly elastic deformation of the segment. When the segment is assumed to be surrounded by a viscous liquid, the following expressions are obtained for the irreversible displacement  $u_{irr}$  of the whole segment, the elastic deformation  $u_e$ , and the highly elastic deformation  $u_{he}$ :

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28669  
S/020/61/140/002/014/023  
B104/B102

The law of deformation of highly ...

$$u_{irr} = \frac{1}{r} \int_0^t F(\tau) d\tau = \frac{1}{r} D^{-1} F \quad (2)$$

$$u_e = \frac{1}{k} F(t) = \frac{1}{k} D^0 F \quad (3)$$

$$u_{he} = \frac{1}{\alpha} D^{-\alpha} F \quad (0 < \alpha < 1; \alpha = \text{const}) \quad (5).$$

Here,  $r$  is the coefficient of viscous resistance of the molecule,  $F(t)$  the force acting on the segment,  $D$  a differential operator,  $k$  the stiffness of the segment. The operator  $D^{-\alpha}$  is given by:

$$D^{-\alpha} f(t) = \frac{1}{\Gamma(\alpha)} \int_0^t f(\tau) (t-\tau)^{\alpha-1} d\tau = \frac{1}{(\alpha-1)!} \int_0^t f(\tau) (t-\tau)^{\alpha-1} d\tau.$$

From these equations, the author concludes that no permanent displacement remains when the action of force has stopped. If the action of force is periodic, vibrations occur which are phase-shifted with respect to the force. The delayed development, which is characteristic of highly elastic deformations, is well described by Eq. (5). Eq. (5) applied to the deformation theory of polymeric bodies gives good agreement with previously found empirical relations and phenomenological theories. Modern ideas about the molecular structure of polymeric are taken into account.

Card 2/3



The law of deformation of highly ...

28669  
S/020/61/140/002/014/023  
B104/B102

The possibility is included of expressing the constants  $r$ ,  $k$ ,  $\kappa$ , and  $\alpha$  by molecular characteristics. There are 1 figure and 15 references: 11 Soviet and 4 non-Soviet. The two references to English-language publications read as follows: First report on Viscosity and Plasticity, 1935; Second Report on Viscosity and Plasticity, 1938; V. Volterra, Theory of Functionals and of Integral and Integro-differential Equations, 1931. 4

ASSOCIATION: Institut elementoorganicheskikh soedineniy Akademii nauk SSSR (Institute of Elemental Organic Compounds of the Academy of Sciences USSR)

PRESENTED: April 15, 1961, by I. V. Obreimov, Academician

SUBMITTED: April 8, 1961

Card 3/3

BARAMBOYM, Bikolay Konstantinovich, prof., doktor khim. nauk;  
SLONIMSKIY, G.L., prof., doktor khim. nauk, retsenzent;  
ALEKSEYENKO, V.I., kand. tekhn.nauk, retsenzent; MINAYEVA,  
T.M., red.; SHAFENKOVA, T.A., tekhn. red.

[Mechanochemistry of polymers; chemistry of mechanical processes involved in the treatment of high polymers] Mekhanokhimiya polimerov; khimiya mekhanicheskikh protsessov pererabotki vysokopolimerov. Moskva, Izd-vo nauchno-tekhn. lit-ry RSFSR, 1961. 250 p. (MIRA 15:2)

(Polymers)

ROGOVINA, L.Z., SLONIMSKIY, G.L.

Study of stress relaxation processes in crystalline and amorphous polymers.

Report presented at the 13th Conference on high-molecular compounds  
Moscow, 8-11 Oct 62

TEYTEL'BAUM, B.Ya.; SOGOLOVA, T.I.; SLONIMSKIY, G.L.

Thermomechanical curve method applied in polymer studies.  
Vysokom. soed. 4 no.12:1879-1880 D '62. (MIRA 15:12)

1. Khimicheskiy institut imeni A.Ye. Arbuzova AN SSSR,  
Fiziko-khimicheskiy institut imeni L.Ya. Karpova i Institut  
elementoorganicheskikh soyedineniy AN SSSR.  
(Polymers)

S/032/62/028/004/020/026  
B124/B101

AUTHORS:

Reztsova, Ye. V., Slonimskiy, G. L., and Chubarova, G. V.

TITLE:

Laboratory setup for repeated stressing of elastic materials  
in various media

PERIODICAL: Zavodskaya laboratoriya, v. 28, no. 4, 1962, 496 - 497

TEXT: A simple device was used to stretch a rubber sample kept in an inert atmosphere 120 times per minute to twice its original length. Stretching is effected by means of a core to which the rubber sample has been attached; this core is drawn into a coil when the circuit is closed. Interruption of current is performed by a Warren motor at a frequency of 120 times per minute. The rubber samples were repeatedly stretched to 50% of their original length in argon. Fatigue strength is given as the number of cycles leading to destruction of the sample. After destruction, residual strain and the character of the rupture were determined. The mean number of cycles causing destruction was  $5.6 \cdot 10^4$  in argon and  $2.6 \cdot 10^4$  in air which indicates the effect of chemically active substances, chiefly atmospheric oxygen, on the examined properties of the material. There

Card 1/2

Laboratory setup for ...

S/032/62/028/004/020/026  
B124/B101

are 1 figure and 1 table.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti  
(Scientific Research Institute of the Tire Industry)

Card 2/2

✓

15 8570

39576

S/G23/62/145/003/010/013  
B101/B144

AUTHORS: Arkhakov, S. A., Rylov, Ye. Ye., Slonimskiy, G. L., and  
Shtarkman, B. P.

TITLE: The role of thermal destruction when molding polymethyl methacrylate powder into monolithic solids

ABSTRACT: Akademiya nauk SSSR. Doklady, v. 145, no. 3, 1962, 595 - 597

NOTE: The authors studied the conditions for the production of molded specimens of polymethyl methacrylate (PMMA) powder which do not lose their transparency when annealed at a temperature  $30^{\circ}\text{C}$  above the vitrification temperature. PMMA specimens were molded at a pressure of  $50\text{ kg/cm}^2$  and a molding temperature ( $t_m$ ) of  $100 - 250^{\circ}\text{C}$ . At  $t_m \sim 135^{\circ}\text{C}$ , the transparency decreased linearly after annealing, at  $\sim 180^{\circ}\text{C}$ , the specimen became opaque. The molecular weight of PMMA decreased above  $130^{\circ}\text{C}$  owing to thermal destruction, then it reached a minimum in the viscous - liquid state at  $170-180^{\circ}\text{C}$  and increased again at  $190-230^{\circ}\text{C}$  owing to easier recombination of macroradicals. Above  $230^{\circ}\text{C}$  decomposition of the macromolecules and

Card 1/2

The role of thermal destruction ...

S/020/62/145/003/010/013  
B101/B144

Formation of gaseous monomers set in. Between 130 and 190°C, transparency decreases with the molecular weight. Conclusions: the loss in transparency is a measure for the relaxation of the grains deformed by molding. Relaxation is caused by separation of C-C bonds. Hence, increased molding pressure or inhibitor addition (0.22% diphenyl picryl hydrazine) decelerates the relaxation and impedes the production of transparent specimens. Measurement of the decrease in specimen height during annealing showed that the logarithm of the molding time depends linearly on the reciprocal temperature at which the height becomes constant. The activation energy (75 kcal/mole) thus calculated, is in good agreement with that of the C-C bond. Perfectly molded specimens are obtained at temperatures and pressures which guarantee complete relaxation. There are 4 figures.

PRESENTED: March 17, 1962, by V. A. Kargin, Academician

ADMITTED: March 17, 1962

Card 2/2



KOZLOV, P.V., otv. red.; ANDRIANOV, K.A., red.; DOGADKIN, B.A., red.;  
DOLGOPLOSK, V.A., red.; YENIKOLOPYAN, N.S., red.; KARGIN,  
V.A., red.; KOLESNIKOV, G.S., red.; KOROTKOV, A.A., red.;  
KORSHAK, V.V., red.; LAZURKIN, Yu.S., red.; MEDVEDEV, S.S.,  
red.; MIKHAYLOV, N.V., red.; PASYNSKIY, A.G., red.;  
SLONIMSKIY, G.L., red.; SMIRNOV, V.S., red.; TSVETKOV, V.N.,  
red.; FREYMAN-KRUPENSKIY, D.A., tekhn. red.

[Adhesion of polymers] Adgeziia polimerov: sbornik statei.  
Moskva, Izd-vo AN SSSR, 1963. 142 p. (MIRA 16:10)  
(Polymers) (Adhesion)

KOLESNIKOV, G.S., otv. red.; ANDRIANOV, K.A., red.; DOGADKIN, B.A., red.; DOLGOPILOSK, B.A., red.; YENIKOLOPYAN, N.S., red.; KARGIN, V.A., red.; KOZLOV, P.V., red.; KOROTKOV, A.A., red.; KORSHAK, V.V., red.; LAZURKIN, Yu.S., red.; MEDVEDEV, S.S., red.; MIKHAYLOV, N.V., red.; PASYNSKIY, A.G., red.; SLONIMSKIY, G.L., red.; SMIRNOV, V.S., red.; TSVETKOV, V.N., red.; FREYMAN-KRUPENSKIY, D.A., tekhn. red.

[Heterochain high-molecular weight compounds] Geterotsepnnye vysokomolekuliarnye soedinenia; sbornik statei. Moskva, Izd-vo "Nauka," 1963. 246 p. (MIRA 17:3)

KOLESNIKOV, G.S., otv. red.; ANDRIANOV, K.A., red.; DOGADKIN, B.A., red.; DOLGOPLOSK, B.A., red.; YENIKOLOPYAN, H.S., red.; KARGIN, V.A., red.; KOZLOV, P.V., red.; KOROTKOV, A.A., red.; KORSHAK, V.V., red.; LAZURKIN, Yu.S., red.; MEDVEDEV, S.S., red.; MIKHAYLOV, N.V., red.; PASYNSKIY, A.G., red.; SLONIMSKIY, G.L., red.; SMIRNOV, V.S., red.; TSVETKOV, V.N., red.; FREYMAN-KRUPENSKIY, K.A., tekhn. red.

[Carbochain high-molecular weight compounds] Karbotsepnye vysokomolekuliarnye soedineniia; sbornik statei. Moskva, Izd-vo AN SSSR, 1963. 287 p. (MIRA 17:1)

S/138/63/000/003/007/008  
A051/A126

AUTHORS: Reztsova, Ye. V., Slonimskiy, G. L., Kargin, V. A.

TITLE: Mechano-chemical phenomena in natural rubber (NR) processing

PERIODICAL: Kauchuk i rezina, no. 3, 1963, 27 - 30

TEXT: A study was made to determine the individual effects of mechanical and chemical phenomena on the properties of an NR-base multi-component system with rubber mix ingredients during the mixing process. The effect of process duration and medium (oxygen, nitrogen, argon) on the properties was investigated. The processing effect was recorded by the number of cycles. The properties of non-vulcanized film after processing under various conditions were studied as to tensility, elasticity and swelling; creep and recovery curves were plotted and the thermomechanical method of investigation was applied. The Polary dynamometer or a stress machine was used to determine the tensile and elastic properties. The latter are found to change sharply during processing. Experimental data proved that the mixing of rubber mixes is a mechano-chemical process. Submitted information proved the necessity for taking into consideration the change in

Card 1/2

Mechano-chemical phenomena in natural...

S/138/63/000/003/007/008  
A051/A126

properties of the raw mix during processing and the possibility of regulating these changes by creating a rational technological process of raw mix preparation. The processing of the systems in an inert medium (nitrogen, argon) and the sharp reduction of the rolling duration ensures a substantial modification of the rubber by chemical reagents and the production of systems with high tensile properties. There are 4 figures.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti  
(Scientific Research Institute of the Tire Industry)

Card 2/2

L 12435-63

EPR/EWP(j)/EPF(c)/EWT(m)/BDS AFFTC/ASD Ps-l/Pc-l/Pr-l

RM/WW

ACCESSION NR: AP3001152

S/0190/63/005/006/0831/0833

7/

AUTHOR: Slonimskiy, G. L.; Yershova, V. A.

70

TITLE: Effect of phase transitions on the mechanical properties of crystalline polymers

SOURCE: Vy\*sokomolekulyarny\*ye soyedineniya, v. 5, no. 6, 1963, 831-833

TOPIC TAGS: phase transition, mechanical properties, crystalline polymers, polytetrafluoroethylene, deformation of polymers

ABSTRACT: Studies were conducted on the rate of deformation of technical polytetrafluoroethylene films in relation to temperature within a -90 to +220C range. It was found that the curves of stretch elongation generally conformed to the laws of gradual transition from the original crystalline state to that of a melt. Some anomalies were, however, noticed at the 19-20C and 28-30C temperature range. A thermogram of the polytetrafluoroethylene, taken by means of Kurnakov's pyrometer, revealed the existence of two distinct endothermic effects at about 20 and 29C, which is in agreement with the well known fact of the occurrence in polytetrafluoroethylene of two phase transformations at 19-20C and 28-30C. Using Poliani's specially thermostated dynamometer, the authors obtained force-to-elongation ratios

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L 12435-63

ACCESSION NR: AP3001152

for every degree of the 15-32C range and were able to demonstrate the existence at 19-20C and 28-30C of peaks in the forced elasticity limit curve. Orig. art. has: 1 chart.

ASSOCIATION: Institut elementoorganicheskikh soyedineniy AN SSSR (Institute of Elemento-organic Compounds, Academy of Sciences SSSR)

SUBMITTED: 16Nov61

DATE ACQ: 01Jul63

ENCL: 00

SUB CODE: 00

NO REF SOV: 010

OTHER: 008

Card 2/2

L 15603-63

EWP(j)/EPF(c)/ENT(m)/BDS

ASD

Pc-4/Pr-4

RM/

WW/JW/MAY

ACCESSION NR: AP3004706

S/0190/63/005/008/1196/1200/68

AUTHORS: Arzhakov, S. A.; Rylov, Ye. Ye.; Slonimskiy, G. L.; Shtarkman, B. P. 66

TITLE: Peculiarities in the formation of monolithic solids under the effect of pressure and temperature on polyacrylonitrile powder

SOURCE: Vyssokomolekulyarnyye soyedineniya, v. 5, no. 8, 1963, 1196-1200

TOPIC TAGS: monolithic solid, polyacrylonitrile, pressure, temperature, plasticization of polymer

ABSTRACT: The present investigation was undertaken to study the formation of transparent monolithic solids from polymeric substances with rigid chains and vitrification temperatures near or above their decomposition margin. Polyacrylonitrile as such (or plasticized by vapors of dimethylformamide) was subjected to various pressures at a temperature range of 50-200C. When the state of transparency (estimated by visual means) had been reached, the corresponding pressure and temperature were recorded and plotted as log P - T. It was found that transparency in the solid state can be achieved at 140C, providing log P is 3.5, while at atmospheric pressure polyacrylonitrile would decompose at 250C before any

Card 1/2



L 15603-63

ACCESSION NR: AP3004706

2

vitreous state had been reached. When subjected to compression at a temperature above 150C, powdered polyacrylonitrile loses its solubility in dimethylformamide, except when brought to a boil. An investigation of the properties of an acrylonitrile-vinyl acetate copolymer at temperatures ranging from 110-250C and pressures of 160-1000 kg/cm<sup>2</sup> revealed the existence of a minimum in the similarly obtained curves, the temperature of which corresponds to the one at which the copolymer loses its solubility in dimethylformamide. Orig. art. has: 2 charts.

ASSOCIATION: none

SUBMITTED: 27Jan62

DATE ACQ: 28Aug63

ENCL: 00

SUB CODE: CH

NO REF SOV: 004

OTHER: 005

Card 2/2

ARZHAKOV, S.A.; RYLOV, Ye.Ye.; SLONIMSKIY, G.L.; SHTARKMAN, B.P.

Role of thermal degradation in the compression molding of  
monolithic solids from powdered polymethyl methacrylate.  
Vysokom. soed. 5 no.10:1513-1519 0 '63. (MIRA 17:1)

ARZHAKOV, S.A.; SLONIMSKIY, G.L.; SHTARKMAN, B.P.; KARGIN, V.A.

Temperature and pressure dependence of the specific volume  
of polymers. Part 1: Polymethyl methacrylate. Vysokom. soed.  
5 no.12:1854-1860 D '63. (MIRA 17:1)

SOGOLOVA, T.I.; SLONIMSKIY, G.L.; KARGIN, V.A.

Viscoplastic flow and flow temperature of polymers. Vysokom.  
soed. 5 no.12:1875-1878 D '63. (MIRA 17:1)

1. Fiziko-khimicheskiy institut im. Karpova i Institut  
elementoorganicheskikh soyedineniy AN SSSR.

KARGIN, V.A., akademik; NEYMAN, M.B., prof.; BUCHACHENKO, A.L.,  
kand. khim. nauk; MIKHAYLOV, V.V.; MASLOVA, I.P.;  
LUKOVNIKOV A.F., kand. khim. nauk; MATVEYEVA, Ye.N.;  
BERLIN, A.A., prof.; YANOVSKIY, D.M., kand. khim. nauk;  
POPOVA, Z.V., kand. khim. nauk; LEVANTOVSKAYA, I.I.;  
KOVARSKAYA, B.M., kand. khim. nauk; ANDRIANOV, K.A., prof.;  
KUZ'MINSKIY, A.S., prof.; SLONIMSKIY, G.L., prof.; MAKUNI,  
Ye.B., tekhn. red.

[Aging and stabilization of polymers] Starenie i stabilizatsiya polimerov. Moskva, Izd-vo "Nauka," 1964. 330 p.  
(MIRA 17:3)

1. Akademiya nauk SSSR. Institut khimicheskoy fiziki.
2. Chlen-korrespondent AN SSSR (for Andrianov).

SLONIMSKI, S.L. (Moscow)

"Mechanical properties and structure of polymers"

Report presented at the 2nd All-Union Congress on Theoretical and Applied Mechanics, Moscow 29 Jan - 5 Feb 64.

ACCESSION NR: AP4009160

S/0190/64/006/001/0153/0157

AUTHORS: Slonimskiy, G. L.; Dikareva, T. A.

TITLE: Studies on anisotropy of mechanical properties of uniaxially oriented polymer films

SOURCE: Vy\*sokomolekulyarny\*ye soyedineniya, v. 6, no. 1, 1964, 153-157

TOPIC TAGS: polymer film, oriented polymer film, uniaxial orientation, reorientation, stretching, crystalline polymer, amorphous polymer, film strength, physical structure, anisotropy, polyethylene, polyethylene terephthalate, caprone, deformation

ABSTRACT: The experimental work was conducted on crystalline technical films of caprone and low density polyethylene, and on a specially prepared amorphous polyethyleneterephthalate (PETP) film. Of these, the caprone film, 70  $\mu$  thick, was already uniaxially oriented during the manufacturing process, while the polyethylene and PETP films were mechanically and optically isotropic. To render them uniaxially oriented, the polyethylene and PETP films were subjected to primary stretching at optimal temperatures, yielding films of 50 and 100  $\mu$ . From each of the three films strips 50 mm wide and 15 mm long were cut, and their uniaxial orientation was

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ACCESSION NR: AP4009160

determined by polaroids. The next step consisted of measuring angles of 10, 20, 30, etc degrees (15, 30, 45 etc. degrees for PETP), and of cutting ribbons 1.5 mm wide and 10 mm long at the set angles to the direction of the original stretch. The samples were then subjected to a second stretching in Polyani's apparatus at a rate of 0.008 cm/sec, at temperatures of 20, 100, and 150C for caprone, 20 and 50C for polyethylene, and 20C for PETP. It was found that in all of the samples (at all temperatures) the strength decreased with an increase in the angle between the directions of the primary and secondary stretch, while the elongation at break showed a direct increase. When a polyethylene film, subjected to a single orientation stretch, was allowed to age for one year, it proved to be stronger when restretched in the same direction, but much weaker at an angle stretch, when compared with the corresponding original values. It was also shown that a forced reorientation of crystalline oriented polymers leads to a lowering of true strength, while the reorientation of an oriented amorphous, polymer brings about an increase of the true strength value. Orig. art. has: 3 charts and 1 table.

ASSOCIATION: Institut elementoorganicheskikh soedineniy AN SSSR (Institute of Elementoorganic Compounds, AN SSSR)

Card 2/3



ACCESSION NO: AP4017631

S/0190/64/006/002/0219/0223

AUTHORS: Slonimskiy, G. L.; Musayelyan, I. N.; Kazantseva, V. V.

TITLE: The mechanical properties of polymer mixtures

SOURCE: Vy\*sokomolekulyarny\*ye soyedineniya, v. 6, no. 2, 1964, 219-223

TOPIC TAGS: polymer, polymer mixture, polypropylene, polyisobutylene, crystalline polypropylene, amorphous polypropylene, stretch, deformation, two phase system, two phase colloidal system, mechanical property, isotactic polypropylene

ABSTRACT: The present study was conducted on mixtures of polypropylenes as such and with polyisobutylene. By consecutive fractionation of technical grade polypropylene an atactic amorphous polypropylene was obtained having a molecular weight of 25 700. This was mixed with isotactic crystalline polypropylene of a molecular weight of 347 000 in 1:3, 1:1, and 3:1 ratios. Mixtures of isotactic crystalline polypropylene with polyisobutylene of 96 500 molecular weight were also prepared in the same ratios. These mixtures were dissolved in decalin at 170-180C, followed by precipitation with acetone and drying in vacuum at 100C. From these samples films were prepared by pressing at 100 kg/cm<sup>2</sup> and at 200C. X-ray study and thermomechanical stretch deformation tests at various temperatures were performed. It was found

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ACCESSION NO: AP4017631

that with a shift in the ratios of the components from 1:3 to 3:1, one could observe a transition from an amorphous system filled with a crystalline component to a crystalline system containing an amorphous filler, representing a two-phase colloidal system. A superposition of three types of deformation which develop to various degrees, depending upon the composition as well as on the temperature, is suggested as an explanation for the observed relationship between ultimate stretch and temperature. Orig. art. has: 3 charts.

ASSOCIATION: Institut elementoorganicheskikh soedineniy AN SSSR (Institute of Elementoorganic Compounds AN SSSR)

SUBMITTED: 020ct62

DATE ACQ: 23Mar64

ENCL: 00

SUB CODE: CH

NO REF SOV: 004

OTHER: 000

Card 2/2

ACCESSION NR: AP4017636

S/0190/64/006/002/0253/0257

AUTHORS: Arzhakov, S. A.; Slonimskiy, G. L.; Arulin, V. I.

TITLE: The dependence of the specific volume of polymers on temperature and pressure. 2. Polymethylmethacrylate plasticized by dibutyl phthalate

SOURCE: Vy\*sokomolekulyarny\*ye soyedineniya, v. 6, no. 2, 1964, 253-257

TOPIC TAGS: polymer, polymethylmethacrylate polymer, plasticizer, dibutyl phthalate, specific volume, pressure, critical pressure, heat expansion; vitrification, vitreous state, high-elasticity state

ABSTRACT: In an earlier publication by S. A. Arzhakov, G. L. Slonimskiy, B. P. Shtarkman, and V. A. Kargin (Vy\*sokomolek. soyed., 5, 1854, 1963) it was shown that the vitrification temperature of polymethylmethacrylate (PMMA) registered a sharp rise at pressures above 1000 kg/cm<sup>2</sup>. The present investigation studied what effect the plastification of PMMA with 5 and 20% of dibutylphthalate (DBP) would have on the specific volume of the polymer, as related to temperature and pressure. The heat expansion of the PMMA polymer, plasticized with 5% DBP, was recorded at constant pressures within a 50-5000 kg/cm<sup>2</sup> range at temperatures up to 350C, as presented in Fig. 1 on the Enclosure. As in the case with the nonplasticized PMMA

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ACCESSION NR: AP4017636

polymer, the V - T curve of the plasticized PMMC polymer shows a sharply defined bend between the two straight-lined sections, separating the glassy and the high elastic states. With increased pressure, the V - T curve shifts into a region of smaller specific volumes. Similar curves were also obtained with the PMMC polymer containing 20% DBP. A comparison with corresponding curves of the nonplasticized PMMC polymer revealed a lowering of the pressure above which the glass transition temperature sets in. This is explained by the fact that the plasticizer fills some of the free spaces within the polymer, which seem to be exhausted at a pressure of 2000 kg/cm<sup>2</sup>. Orig. art. has: 6 charts.

ASSOCIATION: none

SUBMITTED: 29Nov62

DATE ACQ: 23Mar64

INCL: 01

SUB CODE: CH

NO REF SOV: 002

OTHER: 001

END 2/3